United States Courts
Southern District of Texas
FILED

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Michael N. Milby, Clerk

**IN THE UNITED STATES DISTRICT COURT**
**FOR THE SOUTHERN DISTRICT OF TEXAS**
**HOUSTON DIVISION**

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| **PEI-HRENG HOR** | § | **H-08-3584** |
| **PLAINTIFF,** | § | **CASE NO.:** _____ |
| **VS.** | § | |
| **CHING-WU "PAUL" CHU** | § | **JUDGE** _____ |
| **DEFENDANT.** | § | |

## PLAINTIFF'S ORIGINAL COMPLAINT

### PARTIES

1. Plaintiff, Dr. Pei-Hreng Hor ("Dr. Hor"), is an individual residing in Harris County, Texas.

2. Defendant, Dr. Ching-Wu "Paul" Chu ("Dr. Chu"), is an individual who may be served with process at 8010 Harbor Point, Houston, Texas 77071 or wherever he may be found.

### JURISDICTION

3. This is an action arising under the Patent Laws of the United States, United States Code, Title 35. Jurisdiction and venue are predicated upon United States Code, Title 28, §§ 1331, 1338 and 1391. There exists a good faith, ongoing dispute that Defendant violated, and continues to violate, one or more federal statutes by actions he took in this district.

### FACTS

4. This case concerns correction of the inventorship for U.S. Patent No. 7,056,866 (the "'866 Patent"), which deals with various superconductors. See Exhibit 1.

5. In 1986, Dr. Hor was a graduate student in the Physics Department and Research Assistant in Dr. Chu's research group at the University of Houston in Houston, Texas (the "UH").

6. Dr. Chu's group was focused on research related to superconductivity. In particular, the research group was researching materials that would become superconducting at high temperatures.

7. Subjecting materials to high pressure to measure magnetic and conducting properties were special research techniques used by Dr. Chu's group. The group routinely tested all materials under high pressure.

8. Superconductivity is a phenomenon occurring in certain materials, characterized by zero electrical resistance and the exclusion of the interior magnetic field (known as the Meissner Effect).

9. Electrical resistance is a measure of the degree to which an object opposes an electric current passing through it. Electrical resistance is measured in ohms.

10. The electrical resistance of a superconductor drops abruptly to zero when the material is cooled below its superconducting transition temperature ("$T_c$").

11. An electric current flowing in a loop of superconducting wire can persist indefinitely with no power source.

12. Superconductors with a $T_c$ higher than the boiling point of liquid nitrogen (approximately 77° Kelvin) are commercially important because liquid nitrogen can be produced cheaply and is not prone to some of the problems exhibited by other cooling agents. The liquid nitrogen could then be used to cool the "high temperature" superconductor to its $T_c$.

13. In 1986, Dr. Hor was completing experiments and planning his dissertation at the UH.

14. As the most senior graduate student, Dr. Hor assisted in supervising lab activities and training other graduate students.

15. In 1986, Dr. Hor was planning on beginning work as a post-doctoral fellow at Bell Labs in the spring of 1987. However, Dr. Chu approached Dr. Hor and requested that he remain at the UH to serve as the Principal Investigator of Dr. Chu's research group because Dr. Chu was beginning a one year term as a Program Director at the National Science Foundation ("NSF") in Washington D.C. in the Fall of 1986.

16. This position at the NSF would require Dr. Chu to be away from the UH for much of the time during his one year term.

17. Based on his position at the NSF, Dr. Chu was not allowed to supervise the research group. It was considered a conflict of interest for Dr. Chu to maintain his position at the NSF and continue to supervise the research group.

18. Based on Dr. Chu's request, Dr. Hor agreed to stay at the UH and serve as Principal Investigator for Dr. Chu's research group.

19. In September of 1986, Dr. Chu left Houston to begin his service as a Program Director at the NSF.

20. Dr. Chu worked full time at the NSF until September of 1987 returning to Houston on weekends.

21. During Dr. Chu's one year assignment at NSF, Dr. Hor had full authorization to lead the research group.

22. During November 1986, Dr. Hor's colleague R. L. Meng obtained a copy of a paper reporting a possible high superconducting $T_c$ based on a Ba-La-Cu-O system (Barium, Lanthanum, Copper and Oxygen).

23. Both Dr. Chu and Dr. Hor received a copy and reviewed the paper and the research group started working on this material system.

24. As Principal Investigator of the research group, Dr. Hor reviewed the relevant data with R. L. Meng to pin down the material synthesis conditions to produce optimal $T_c$ .in the Ba-La-Cu-O system.

25. R. L. Meng was the only researcher in the group with a background in material science and was responsible for synthesizing all the samples.

26. The research group's early high pressure experiments on the Ba-La-Cu-O sample showed an exceptional increase of $T_c$, which resulted in a paper published in Physical Review Letters paper in which Dr. Hor was listed as the second author. See Exhibit 2.

27. Dr. Hor's contribution to this effort was also clearly documented in Dr. Chu's memo of December 15, 1986, recommending his appointment as a research associate. See Exhibit 3. In that memo, Dr. Chu stated "He (Dr. Hor) has contributed significantly to the understanding and creation of high temperature superconductivity [.]" See Exhibit 3.

28. It was later discovered that a high $T_c$ in the Ba-La-Cu-O system was induced by replacing a small amount (less than 30%) of Lanthanum ($La^{+++}$) by Barium ($Ba^{++}$) ions, known as doping. The doping is performed in samples with a ratio of chemical compositions of Lanthanum:Copper:Oxygen that was 2:1:4, the so-called 214 system. Without doping, the 214 Ba-La-Cu-O system is not a superconductor.

29. The high pressure result in the Ba-La-Cu-O system also prompted the research group to mimic physical pressure by changing the chemical composition of the Ba-La-Cu-O system through replacement of the larger Barium ($Ba^{++}$) ions with smaller Strontium ($Sr^{++}$) and Calcium ($Ca^{++}$) ions.

30. Using so-called "chemical pressure" to mimic physical pressure is well-known in the field of high pressure material research.

31. At the end of December 1986, during a discussion in Dr. Hor's office where Dr. M. K. Wu, R. L. Meng, and L. Gao were present, Dr. Hor informed Dr. Wu (a superconductor researcher at the University of Alabama in Huntsville) that a Strontium ($Sr^{++}$) substitution for Barium ($Ba^{++}$) increased $T_c$, but a Calcium ($Ca^{++}$) substitution for Strontium actually decreased $T_c$. Knowing that Calcium ($Ca^{++}$) is smaller than Lanthanum ($La^{+++}$), Dr. Hor pointed to a Periodic Table of the Elements and suggested substituting Yttrium ($Y^{+++}$) for Lanthanum.

32. Dr. Hor's conception of replacing the lattice element Lanthanum ($La^{+++}$) with the iso-valent element Yttrium ($Y^{+++}$) ion ultimately resulted in the creation of a YBCO (Yttrium-Barium-Copper-Oxygen) compound that exhibited superconductivity above 77°K.

33. Immediately after this discussion, Dr. Hor ordered Yttrium for the research group to begin conducting the Yttrium substitution experiments.

34. Dr. Hor also asked R. L. Meng to record various formulas for conducting the Yttrium substitution experiments, which she did in early January of 1987. See Exhibit 4.

35. Dr. Chu was informed of Dr. Hor's idea and the plans for research involving Yttrium.

36. On or about January 12, 1987, without Dr. Hor's knowledge, Dr. Chu filed the first patent application related to the YBCO superconductor (U.S. Patent Application No. 07/002,089,

now abandoned). This patent was primarily based on the previously identified 214 system. See Exhibit 5.

37. Dr. Chu, without Dr. Hor's or any other group member's knowledge, filed Application No. 07/002,089 based on Dr. Hor's conception of Yttrium substitution for Lanthanum as a means to produce high temperature superconductors.. In this application, Dr. Chu erroneously listed himself as the sole inventor. See Exhibit 5.

38. On or about January 26, 1987, Dr. Chu filed a continuation-in-part application (U.S. Patent Application No. 07/006,991, now abandoned).

39. The January 26, 1987 continuation-in-part application did not include any significant changes to the basic inventions described in U.S. Patent Application No. 07/002,089. The only changes were to more fully describe the inventions and slightly broaden the range of chemical composition of the superconducting materials covered in the original application. See Exhibit 6.

40. On January 29, 1987, Dr. Wu of the University of Alabama called Dr. Hor claiming that he observed superconductivity above 77°K.

41. During the phone conversation with Dr. Hor, Wu admitted his experiments and observations were based on the earlier discussion in Dr. Hor's office in December of 1986. This was partially confirmed by Dr. Chu in an article written by him in which he stated that Wu told Dr. Hor, "We just did what we discussed previously (in Houston in early January)." See C.W. Chu, High Temperature Superconductivity, NATO Advanced Research Workshop on the History of Original Ideas and Basic Discoveries in Particle Physics, p. 808 (1996). See Exhibit 7.

42. Immediately after this phone call with Dr. Wu, Dr. Chu asked Dr. Hor to write down the formulas that Dr. Hor conceived during the discussion in December 1986. These

formulas included Yttrium substitution for Lanthanum in the 214 system with greater ranges of chemical compositions. The formulas were recorded by R. L. Meng in her laboratory notebook dated January 29 and 30, 1987 which was confirmed by Dr. Chu's a paper published in IEEE Transactions on Applied Superconductivity, Vol 7., No. 2, June 1997. See C.W. Chu, High-Temperature Supreconducting Materials: A Decade of Impressive Advancement $T_c$, at p. 83. See Exhibits 7 and 8.

43. Aside from the substitution of Yttrium for Lanthanum, there was another element, Scandium (Sc), among the other elemental substitutions that Dr. Hor conceived. This was communicated to Dr. Chu in the formulas recorded in the group's lab notes on January 29 and 30, 1987.

44. On or about February 6, 1987, only after Dr. Hor provided Dr. Chu with the information regarding the Scandium substitution, Dr. Chu filed another continuation-in-part application to include the Scandium substitution (U.S. Patent Application No. 07/006,991, now abandoned). See Exhibit 9.

45. Substitution of Scandium was the only significant change made for substitution of the lattice element Lanthanum in the February 6, 1987 continuation-in-part application.

46. In the February 6, 1987 continuation-in-part application, Dr. Chu again erroneously claimed that he was the sole inventor.

47. By March 9, 1987, Dr. Chu, R. L. Meng and Dr. Hor had worked together and successfully separated high purity YBCO samples exhibiting $T_c$ of 90°K. These samples had a ratio of chemical composition of Yttrium:Barium:Copper that was 1:2:3. Based on these high-purity samples, the crystal structure of the YBCO superconductor was identified as the so-called 123-phase.

48. After the YBCO 123-phase had been identified and successfully tested, Dr. Hor continued to perform experiments in an attempt to discover why the YBCO compound was a superconductor with such a high $T_c$.

49. Up to March 1987, it was well known among superconductor researchers that magnetic elements in the material will degrade $T_c$, a phenomenon known as the "pair-breaking effect."

50. On March 12, 1987, as part of his experiments, Dr. Hor asked R. L. Meng to completely replace Yttrium in the YBCO 123-phase with the magnetic rare earth element Gadolinium (Gd) in order to study the pair-breaking effect due to the presence of magnetic ions. Surprisingly, no degradation of $T_c$ was observed.

51. Therefore, due to the negative result of the magnetic "pair-breaking effect" experiment, Dr. Hor conceived the original idea that substitution of magnetic ions in the 123-phase could produce new high temperature superconductors.

52. Dr. Hor asked R. L. Meng to perform complete substitution of Yttrium with the rare-earth elements in the periodic table, and, subsequently, a new superconductor was discovered during every attempt.

53. Dr. Chu was not in the laboratory during the time when the rare-earth element superconductors were being discovered.

54. The discovery of these new superconductors was communicated to Dr. Chu by R. L. Meng over the phone when Dr. Chu was traveling and giving talks.

55. The whole series of rare earth based high temperature superconductors were synthesized, tested an discovered based on Dr. Hor's conception and at his direction.

56. This research and discovery resulted in a Physical Review Letters paper in which Dr. Hor was listed as the first author that was published on May 4, 1987. See Exhibit 10.

57. Dr. Hor's invention of rare-earth substitution to produce high temperature superconductors based on the 123-system have subsequently appeared in yet another continuation-in-part application filed on March 26, 1987 by Dr. Chu (U.S. Patent Application No. 07/032,041). In this continuation-in-part application, Dr. Chu abandoned the composition ranges included in the previous applications and completely revised the range of chemical composition for "x" from 0.01-0.5 to 0.6-0.9 which included the 123-phase composition. Dr. Chu also added all the rare earth elements that Dr. Hor conceived and tested. See Exhibit 11.

58. The previous applications did not include the 123-phase composition.

59. In the March 26, 1987 continuation-in-part application, Dr. Chu again erroneously stated that he was the sole inventor.

60. Dr Chu has previously admitted that Dr. Hor "and colleagues under his direction discovered the whole series of the so-called 123 compounds $REBa_2Cu_3O_7$ ["RE" meaning rare earths such as Gadolinium, Ytterbium, Lutetium etc. that are covered by the '866 Patent] the most important HTS [High Temperature Superconductor] compound system to date for both scientific study and large-current applications above 77K." See Exhibit 12.

61. On or about June 3, 1987, Dr. Chu executed a declaration stating he is the sole inventor of U.S. Patent Application No. 07/032,041. This declaration and the related application ultimately resulted in the issuance of the '866 Patent. Exhibit 13.

62. While he was Principal Investigator of the research group, Dr. Hor conceived of all of the claims related to the elemental substitutions of Lanthanum by Yttrium, and the rare earth elements Neodymium, Samarium, Europium, Gadolinium, Dysprosium, Holmium, Erbium,

Thulium, Ytterbium and Lutetium, which are claimed in the "'866 Patent" and the continuation-in-part applications filed by Dr. Chu between January 12, 1986 and March 26, 1986, that eventually led to the discovery of a series of superconductors with high $T_c$.

63. In all of Dr. Chu's published papers after the discovery of YBCO, in discussing the discovery of rare earth-based high temperature superconductors, he has consistently claimed that when a large fraction of Yttrium is replaced by the magnetic Gadolinium and Europium, no depression of $T_c$ was detected. See, e.g., C.W. Chu, *Superconductivity Above 90K and Beyond*, p. 23. Exhibit 14.

64. Dr. Chu's statement is scientifically incorrect because without complete replacement of Yttrium there is always a possibility that some pure high $T_c$ YBCO phase will be present in the newly synthesized compound. Without careful phase and structural analysis of the new compound, no conclusions could have been drawn by any type of partial substitutions under the conditions present at UH at that time.

65. After the YBCO 123-phase was identified, there was no laboratory record for the research group of any large fraction replacement of Yttrium with Gadolinium and Europium using the 123-phase formula. There were only complete Yttrium substitutions by Gadolinium and other rare-earth elements as conceived by Dr. Hor and recorded in the research group's laboratory notebook. See Exhibit 15.

66. On or about January 19, 2006, Dr. Hor first learned that he had not been named as an inventor in the "866 patent" and the various related applications and continuation-in-part applications based on his conceptions.

67. On January 27, 2006, Dr. Hor and R. L. Meng went to the office of the UH's Vice Chancellor for Intellectual Property, Mr. John Warren, and reported that Dr. Hor conceived of

the Yttrium substitution and rare earth substitutions which led to the discovery of the YBCO 123 phase which formed the basis for the '866 patent.

68. Dr. Chu always listed himself as the first author of all the Physical Review Letters papers published at UH up to 1986.

69. Dr. Hor was listed as the first author of the UH group for all papers submitted to and published in the Physical Review Letters related to the discovery of YBCO. See Exhibits 10, 16 and 17.

70. Being listed as first author in the academic and scientific community indicates that person has provided the most significant contribution to the scientific discovery.

71. On June 6, 2006, the '866 issued. See Exhibit 1.

72. On or about June 3, 1987, pursuant to express UH policy governing intellectual property, Dr. Chu assigned his interest and rights in the '866 Patent to the UH.

73. At the time of Dr. Hor's conception of the invention leading to the issuance of the '866 Patent he was a graduate student and employee of the UH.

74. Pursuant to UH policy, Dr. Hor would have been required to assign his interest in the '866 Patent (or any patent resulting from his inventions) to the UH.

75. At that time, UH policy also provided that inventors, such as Dr. Hor, would receive a specified percentage of any monies received by the UH as a result of licensing or transfer of the patent.

76. Dr. Hor was previously recognized as an inventor by the UH and his economic interest in the '866 Patent was confirmed because he received a share of funds that the UH received from DuPont in connection with preliminary licensing of the '866 Patent.

77. On or about June 1, 1988, UH also licensed its interest and rights in the '866 Patent to the National Aeronautical and Space Administration ("NASA").

78. Upon information and belief, the UH has also licensed its interest and rights in the '866 Patent to other persons.

79. Upon information and belief, UH, NASA and/or other licensees continue to market and commercially exploit the '866 Patent without recognition of Dr. Hor as an inventor.

**COUNT ONE – CORRECTION OF INVENTORS**

80. Plaintiff incorporates paragraphs 1-68 herein by reference.

81. This is a suit to correct the inventors named in the '866 Patent. Dr. Chu, through innocent omission and/or oversight, failed to name Dr. Hor, who contributed to the conception of one or more claims as a joint inventor in the '866 Patent.

82. Dr. Hor attempted to resolve this dispute administratively by filing a grievance pursuant to the UH's internal policies and grievance procedures.

83. The UH has refused to allow the grievance process to go forward and as a result no decision on Dr. Hor's grievance has been reached.

84. Therefore, there remains a good faith, ongoing dispute regarding Dr. Hor's contribution to the '866 Patent as an inventor.

85. By failing to name Dr. Hor as a joint inventor in the declaration filed on June 3, 1987 in support of the '041 Application", Dr. Chu violated 35 U.S.C. §§115 and 116, which require the identification of each inventor in the oath or declaration supporting a patent application.

86. Without correction of the named inventors under 35 U.S.C. §256, Dr. Chu's violation of these federal statutes will continue unabated to the detriment of Dr. Hor and the public at large.

87. Dr. Hor therefore, requests correction of the inventors named in the '866 Patent to insure compliance with the federal requirements for filing patent applications, to preserve his good name and reputation, and to properly identify the inventors for the benefit of the public.

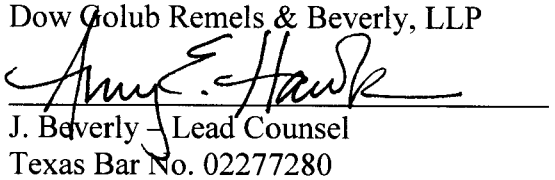
## PRAYER

For these reasons, Plaintiff Pei-Hreng Hor asks that Defendant Ching-Wu Chu be cited to appear and answer herein and for the Court to declare Dr. Hor a joint inventor of the '866 Patent and direct the Director of the U.S. Patent & Trademark Office to issue a Certificate of Correction to name Pei Hor as an inventor in the '866 Patent.

Dated: December 5, 2008.

Respectfully submitted,

Dow Golub Remels & Beverly, LLP



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